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Dielectric Materials for Use in Thin-Film Capacitors

An investigation has been carried out concerning the properties of a number of dielectric materials for use in thin-film capacitors which have come into popular use in integrated circuitry. To date silicon monoxide and tantalum pentoxide have been widely used in such applications but suffer from low dielectric constant (silicon monoxide) and low dielectric breakdown voltage (both). This low dielectric breakdown strength relegates their use to low speed circuitry, thereby denying their use in the medium of integrated circuitry, so useful in high speed switching, etc.

The report of this investigation presents details of dielectric properties measured at 300°K for thermally evaporated oxides from 300-to-6000Å in thickness of the following metals:

Scandium	Samarium
Vanadium	Gadolinium
Yttrium	Dysprosium
Lanthanum	Holmium
Cerium	Erbium
Praseodymium	Ytterbium
Neodymium	

Thin evaporated aluminum electrodes were used to impress voltages across the oxide layers in the range of 0-to-75 volts. Dielectric breakdown strengths in excess of 5×10^6 v/cm were observed.

Relative dielectric constants measured for the oxides ranged from 2-to-20, and measured capacitances were as high as 156×10^{-9}f/cm^2. The oxides of Ce, La, Nd, Gd, Pr, and Er showed great promise as potential materials for use in thin-film capacitors.

Note:

The following documentation may be obtained from:

The Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65

Reference: NASA CR-90301 (N68-11024), An Experimental Investigation of Properties of Dielectric Materials for Use in Thin Film Capacitors

Source: H. E. Carr, W. D. Foster, T. A. Harbuck, and A. T. Fromhold, Jr. of Auburn University under contract to Marshall Space Flight Center (MFS-20471)

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